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(19) (CA) **CANADIAN PATENT** (12)

(54) METHOD AND APPARATUS FOR SEPARATING GAS FROM LIQUID

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No. OF CLAIMS 4

This invention relates to the deaeration of liquids, and in particular to a method and an apparatus for deaerating water.

Water and other liquids are typically deaerated by subjecting the liquid to a vacuum, preferably when the fluid is dispersed throughout a packing. Such a method is disclosed, for example in Canadian Patent No. 829,098, which issued to F. L. Murdock on December 9th, 1969. Canadian Patent No. 524,309, which issued to the Permutit Company on April 24th, 1956 discloses a method of heating and deaerating water in which the water is sprayed downwardly in a plurality of conically shaped streams, collecting the water and contacting it with steam to heat the water to remove dissolved gases. Canadian Patent No. 550,210, which issued to AB Svenskt Konstsilke discloses a method of recovering gases from waste water by passing the waters through a zone under sufficiently low pressure for the waters to boil, cooling the vapors and gases evolved in such zone, and recovering at least one of the gases.

Applicants have discovered that the vacuum required to deaerate water can be at least partially created by dropping the water through a distance in a tube or casing and removing the released air by means of a vacuum pump.

Accordingly, the present invention provides a method for separating a gas from a liquid comprising the steps of passing said liquid in dispersed form through a packed column while applying a vacuum thereto; and dropping the liquid from the column through a distance to create at least a portion of said vacuum in said column thereby increasing the efficiency of the apparatus.

The invention also provides an apparatus for carrying

out the method comprising a packed column; inlet means for feeding a liquid in dispersed form into said column; means for subjecting said liquid to at least a partial vacuum in said column to remove some of the gas from the liquid; an outlet in the bottom of said column; and vertical tube means attached to said outlet for receiving said liquid, so that the liquid can drop freely under the influence of gravity; said tube means being of sufficient length to create at least a portion of said vacuum in said column thereby increasing the efficiency of the apparatus.

The invention will now be described in greater detail with reference to the accompanying drawing, the single figure of which is a schematic block diagram of one embodiment of the apparatus of the present invention.

With reference to the drawing, the apparatus of the present invention is intended to deaerate water contained in a reservoir 1. The water is fed from the reservoir through an inlet tube 2 and a needle valve 3 into a packed column 4. The column 4 is packed with Raschig rings(not shown). Water from the tube 2 is sprayed onto the rings through a dispersion tube (not shown) on the outlet end of the tube 2 within the column 4. The column 4 is equipped with a vacuum gauge 5.

An outlet tube 6 is provided in the bottom end of the column 4 for receiving water from the rings. The tube 6 is lengthy and curves upwardly at its bottom end 7, i.e. the tube 6 is a U-tube, the height of the turned up end 7 controlling the column head.

An outlet duct 8 in the top end of the packed column 4

connects the latter to a condenser 9. The condenser 9 is connected to a drying tower 10 by a tube 11. A line 12 equipped with a valve 13 connects the tube 11 to the atmosphere for breaking the vacuum in the tube 11 and the column 4. The drying tower 10 is connected to a vacuum pump 14 by a tube 15.

In an experimental version of the apparatus described above, the water inlet temperature was 55-60°F and the outlet temperature slightly lower. The vacuum gauge reading was 730 to 760 mm of mercury. The tube 6 was 34 to 35 feet in length. Samples were taken from the reservoir 1, and from the outlet end 7 of the tube 6. Peak heights of air in the water reservoir measured using gas chromatography was 80 to 180 mm, while that from the outlet end 7 of the tube 6 was approximately 2 mm. Thus, from 95 to 98% of the air entrained in the feed water was removed using the method and apparatus of the present invention. The results were confirmed using a dye colour method.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for separating a gas from a liquid comprising the steps of passing said liquid in dispersed form through a packed column while applying a vacuum thereto; and dropping the liquid from the column through a distance to create at least a portion of said vacuum in said column thereby increasing the efficiency of the apparatus.

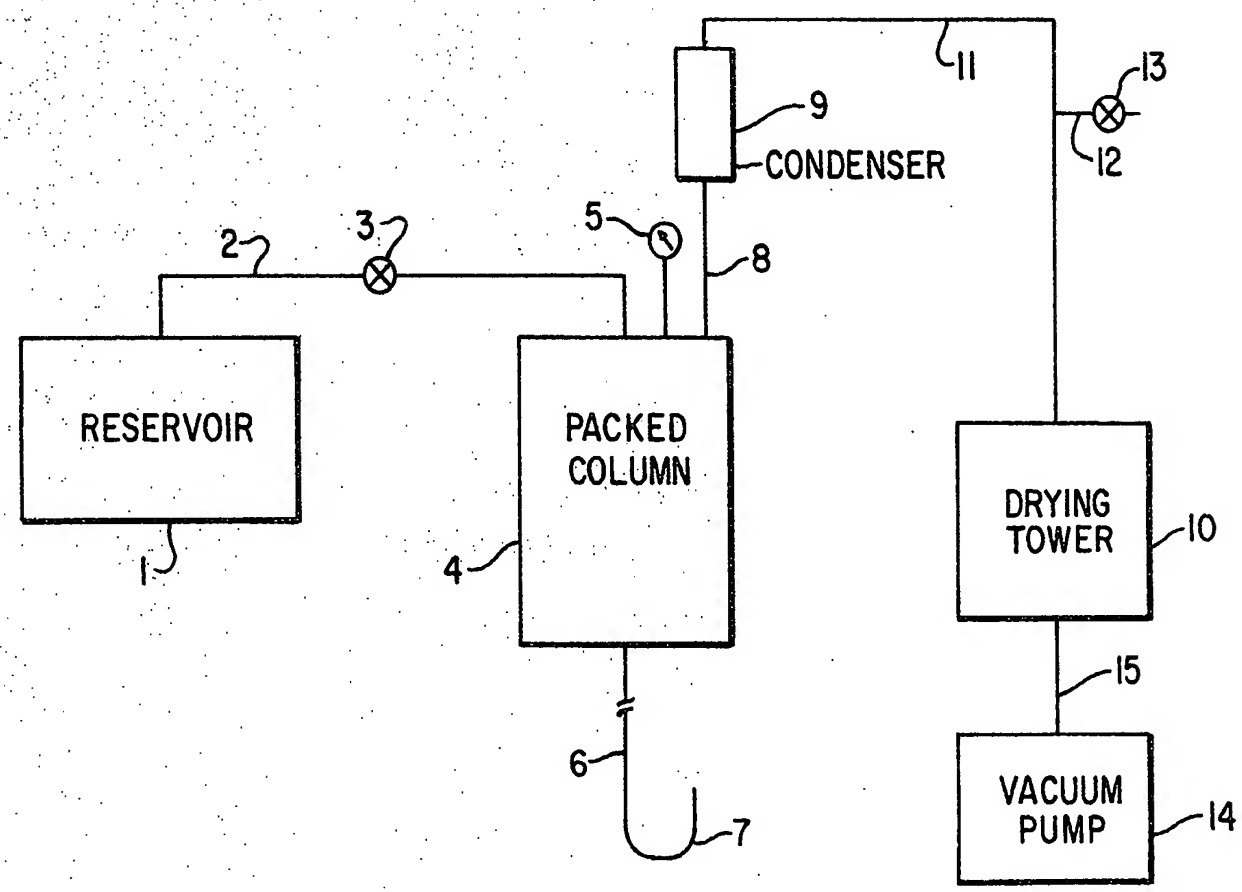
2. A method according to claim 1, wherein said liquid is water and said gas is air.

3. An apparatus for separating a gas from a liquid comprising a packed column; inlet means for feeding a liquid in dispersed form into said column; means for subjecting said liquid to at least a partial vacuum in said column to remove some of the gas from the liquid; an outlet in the bottom of said column; and vertical tube means attached to said outlet for receiving said liquid, so that the liquid can drop freely under the influence of gravity, said tube means being of sufficient length to create at least a portion of said vacuum in said column thereby increasing the efficiency of the apparatus.

4. An apparatus according to claim 3, wherein said inlet means includes a dispersion tube for spraying liquid onto packing in said column.

ABSTRACT OF THE DISCLOSURE

Water is deaerated by the action of the vacuum pulled by the effect of gravity on a standing column of water. The air released is removed by a vacuum pump. The lower end of the column is immersed in deaerated water to form a seal to prevent loss of vacuum.



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